National Aeronautics and Space Administration

NASA Langley's
Multi-Axis Accelerometer Calibration System

Using a cuboidal attitude positioning device

Researchers at NASA's Langley Research Center have developed a low-cost, portable, and simplified system suitable for in-situ calibration and/or evaluation of multi-axis inertial measurement instruments (e.g., accelerometers). This system overcomes facility restrictions and maintains or improves the calibration quality for users of accelerometer-based instruments with applications in avionics, experimental wind-tunnel research, and force balance calibration applications.

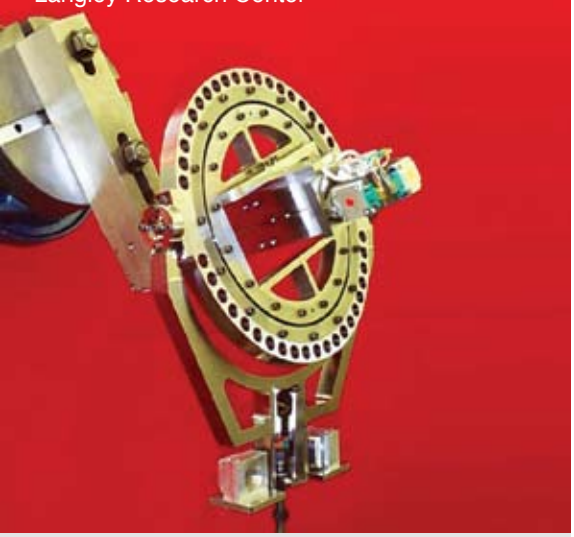
Benefits

This technology overcomes the limitations and restrictions on accelerometer calibration facilities by:

- Minimizing reliance on a fixed calibration system
- Leveraging the user's data acquisition system
- Increasing calibration frequency due to improved accessibility
- Automatically compensating for local gravitational field

partnership opportunity

Langley Research Center



Applications

The technology offers wide-ranging market applications, including:

- Aeronautics and space – inertial navigation systems
- Robotics – industrial, high-precision leveling or positioning
- Research – experimental research facilities

The Technology

NASA inventors have developed this innovative calibration apparatus to quickly and easily position a multi-axis accelerometer system into a precisely known orientation suitable for in-situ quality checks and calibration. In addition, the system incorporates powerful and sophisticated statistical methods, known as response surface methodology and statistical quality control. These methods improve calibration quality, reduce calibration time, and increase calibration frequency, which enables the monitoring of instrument stability over time.

The cuboidal positioning system can be used to calibrate or evaluate single, dual, or tri-axial packages. Other features and benefits of the technology include the following:

- Allows for in-situ calibrations that are robust to operator error
- Mechanically simpler – provides higher precision
- Compensates for local gravitational constant
- Employs a simplified, linear mathematical model that is a function of gravitational components
- An order of magnitude reduction in system cost over traditional systems
- Utilizes an experimental design that:
  - minimizes the number of calibration points
  - defends against systematic error
  - internally detects several forms of operator error

Verification of the technology is complete, and NASA has built three systems in support of program operations. Further development is expected to expand the system's capabilities to other instruments and to complete temperature characterization.

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

The Technology Gateway

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